the cam having a groove threaded so that the moving speed decreases immediately before the plate contacts said sealing surface and said plate is locked in a state of rest when it contacts the sealing surface and can withstand forces on the plate caused by pressure differential between the chambers that biases the plate away from the sealing surface.

Please cancel Claims 2 and 9 without prejudice.

Please add the following claim:

11. (New) The device as claimed in Claim 3, wherein the length of each section of the cam groove is as follows: (III) > ((IV) or (V)) > ((I) or (II)).

REMARKS

Claims 1, 3, 4 and 6-8 have been amended and Claim 11 has been added. Support for Claims 1 and 8 can be found throughout the specification, for example. Claims 6 and 7 have been amended to correct informalities. Support for Claim 6 can be found throughout the specification, for example. Support for Claim 7 can be found on page 5, lines 28-29, for example. Support for Claim 11 can be found in Figure 1(c), for example. Claims 2 and 9 have been canceled without prejudice. Accordingly, Claims 1, 3-8, 10 and 11 are pending in this application. The specification has been amended to correct typographical error. Support for the correction can be found on page 6, line 8, for example. As such, no new matter has been added. Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE." Applicants respectfully request entry of the amendments and reconsideration of the application in view of the amendments and the following remarks.

Rejection of Claims 1-10 Under 35 U.S.C. § 103

Claims 1 and 6-8 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Adams (US Patent 6959507) in view of Hautau (US Patent 4134305). Claims 2-4 and 9 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Adams (US Patent 6959507) in view of Hautau (US Patent 4134305) and further in view of Predhome Jr (US Patent Re 30188). Claims 5 and 10 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Adams (US Patent 6959507) in view of Hautau (US Patent 4134305) and further in view of Philips et al. (US Patent 4889319). Applicants respectfully traverse this rejection under 35 U.S.C. § 103(a). The claims as amended herein, patentably distinguish over a combination of the

references. Claims 1 and 8 are independent, and the remaining claims are ultimately dependent on either of Claims 1 and 8. The patentability of Claims 1 and 8 will be explained below.

The divider plate in the present invention is single, whereas the divider plate in Adams is not single but three (top plate 72, middle plate 74, and bottom plate 76) as is apparent from the structure in FIG. 2 of Adams. Accordingly, the chambers in the present invention are two (upper chamber 15 and lower chamber 16), whereas the chambers in Adams are three (upper chamber 34, middle chamber 36, and lower chamber 38). See FIG. 2 and column 5, lines 20-21 of Adams (US Patent 6959507).

In view of the distinct structure, when the divider plate in the present invention is at the upper position, the upper chamber is at the second pressure which is higher than the first pressure while the lower chamber is at the first pressure to cause a pressure difference exerting downward force on the plate. On the other hand, when the divider plate in the present invention is at the lower position, the lower chamber is at the second pressure which is higher than the first pressure while the upper chamber is at the first pressure to cause a pressure difference exerting upward force on the plate. However, the cam follower is configured to be locked in the cam groove to withstand forces on the plate caused by pressure differential between the chambers, thereby holding the divider plate in a state of rest against the force generated by a pressure difference between the chambers. See Claim 1 as amended herein and page 8, lines 15-17 of the Applicants' specification.

In contrast, the chambers in Adams are divided into three. When middle chamber 36 is at a reduced pressure, both upper chamber 34 and lower chamber 38 are at higher pressure than that of middle chamber 36. Therefore, the chambers in Adams do not raise pressure differential between the chambers as the claimed invention and do not need the plate lift mechanism as claimed. Thus, there is no motivation for Adams to provide the plate lift mechanism of cylindrical cam structure and a rotary actuator. The remaining references (Hautau, Predhome Jr, and Philips et al.) in no way disclose or suggest the structure of a multi-chamber load-locking device as recited in Claim 1. Thus, a combination of Adams and the remaining references could not lead to the claimed invention. Thus, Claim 1 is not obvious in view of the above references.

"To establish a *prima facie* case of obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. If an independent claim is nonobvious

under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious." (M.P.E.P. § 2143.03) Thus, Claim 1 and its dependent claims are not obvious in view of the references.

Claim 8 essentially recites the features of Claim 1, and is further characterized by that the moving speed decreases immediately before the plate contacts a sealing surface. Thus, as with Claim 1, Claim 8 and the claim dependent thereon are not obvious in view of the references. Applicants respectfully request withdrawal of this rejection.

Claim 11 has been added by the current amendment. Claim 11 recites the features of Claims 1 and 3, and is further characterized by the length of each section of the cam groove. The present invention addresses the problem that at the time of sealing, the divider plate needs to slow down immediately before a sealing position to prevent particle contamination from an O-ring seal, and likewise, when the divider plate separates from the seal, it should move slowly and the moving speed should increase after the divider plate separates from the seal completely. By employing the structure as recited in Claim 11, the above problem can be effectively resolved. Thus, Claim 11 can be also patentably distinguished over a combination of the references.

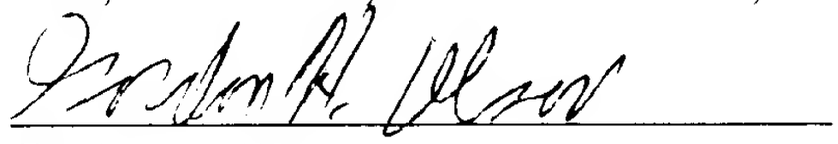
CONCLUSION

In light of the Applicants' foregoing Remarks, it is respectfully submitted that the present application is in condition for allowance. Should the Examiner have any remaining concerns which might prevent the prompt allowance of the application, the Examiner is respectfully invited to contact the undersigned at the telephone number appearing below.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: June 27, 2002 By: 

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Paragraph beginning at line 5 of page 6 has been amended as follows:

Figure 1(b) shows a position where the plate 2 is at the highest position and seals the sealing surface 13. As a result, the load-locking chamber 1 is divided into two chambers (15, 16). The two chambers have no airflow. Semiconductor wafers 9 are brought in via the gate valve 10 from the load stations to the first chamber 15. At this time, a pressure within the first chamber ~~16~~15 is atmospheric pressure. The gate valve 11 of the second chamber is shut and the air is exhausted by a vacuum pump (not shown). At this time, force generated by a pressure difference between the two chambers acts in the direction from the first chamber to the second chamber. The second chamber 16 is connected with the transfer chamber (not shown). As shown in the figure, the volume in the second chamber is greater than that in the first chamber.

IN THE CLAIMS:

Claims 1, 3, 4 and 6-8 have been amended as follows:

1. (Amended) A multi-chamber load-locking device for transferring wafers between a first-pressure area and a second-pressure area, said device having an interior divided into (i) an upper chamber and (ii) a lower chamber, both of which are for transferring wafers at the second pressure which is higher than the first pressure, and (iii) an intermediate section located between the upper chamber and the lower chamber, which is for loading/unloading wafers at the first pressure, said device comprising (a) a single divider plate having an upper side and a lower side, both of which are for temporarily supporting wafers, said plate moving reciprocally between an upper position and a lower position; (b) a cylindrical cam structure co-axially connected to said plate, wherein said plate moves between the first position and the second position by rotation of the cylindrical cam structure; and (c) a rotary actuator for rotating the cylindrical cam structure, said cam structure comprises (1) a cam cylinder having a cam groove which rotates with the rotary actuator, and (2) a support cylinder having a cam follower which support cylinder is attached to the plate and does not rotate, wherein the cam follower is fitted in the cam groove and moves vertically when the cam groove rotates, said support cylinder being provided inside or outside the cam cylinder, wherein

when the plate is at the upper position, the plate divides and seals the upper chamber from the intermediate section and the lower chamber, wherein the upper chamber is at the second

pressure while both the intermediate section and the lower chamber are at the first pressure to cause a pressure difference exerting downward force on the plate, the cam follower being configured to be locked in the cam groove to withstand the downward force on the plate, whereby wafers at the upper side of the plate are transferred between the first-pressure area and the second-pressure area via the upper chamber, and

when the plate is at the lower position, the plate divides and seals the lower chamber from the intermediate section and the upper chamber, wherein the lower chamber is at the second pressure while both the intermediate section and the upper chamber are at the first pressure to cause a pressure difference exerting upward force on the plate, the cam follower being configured to be locked in the cam groove to withstand the upward force on the plate, whereby wafers at the lower side of the plate are transferred between the first-pressure area and the second-pressure area via the lower chamber~~,~~

~~said device further comprising:~~

~~a cylindrical cam structure co-axially connected to said plate, wherein said plate moves between the first position and the second position by rotation of the cylindrical cam structure; and~~

~~a rotary actuator for rotating the cylindrical cam structure~~.

3. (Amended) The device as claimed in Claim ~~2~~1, wherein the cam groove has a shape threaded into five sections constituted by (I) an upper horizontal section for locking the plate at the upper position, (II) a lower horizontal section for locking the plate at the lower position, (III) ~~a~~ an intermediate section for moving the plate at a predetermined rate, (IV) an upper transition section for connecting the upper horizontal section and the intermediate section, and (V) a lower transition section for connecting the lower horizontal section and the intermediate section,

wherein the moving speed of the plate decreases immediately before sealing the upper chamber and the lower chamber with the plate when the cam follower is in the upper transition section and the lower transition section, respectively; the plate is locked upon sealing the upper chamber and the lower chamber when the cam follower is in the upper horizontal section and the lower horizontal section, respectively; and the plate moves vertically at a rate when the cam follower is in the intermediate section.

4. (Amended) The device as claimed in Claim ~~2~~1, further comprising a vertical beam provided in parallel to the axis of the cam cylinder, and a sliding support which is affixed to the support cylinder and slides on the beam when the support cylinder moves vertically.

6. (Amended) The device as claimed in Claim 1, wherein the first pressure is ~~an atmospheric~~a reduced pressure, and the second pressure is ~~a reduced~~an atmospheric pressure.

7. (Amended) The device as claimed in Claim 1, which is adapted to be disposed between a loading station which places a wafer cassette accommodating semiconductor wafers, and a transfer chamber which conveys the semiconductor wafers, wherein the intermediate section is connected to the ~~loading station~~transfer chamber, and the upper chamber and the lower chamber are connected to the ~~transfer chamber~~loading station.

8. (Amended) In a multi-chamber load-locking device which is placed between a loading station which places a wafer cassette which houses semiconductor wafers, and a transfer chamber which conveys said semiconductor wafers, and in which lock-loading device chamber space is divided into two chambers by the vertical motion of a single plate which contacts air-tightly a sealing surface of each of the two chambers,

~~wherein the~~an improvement ~~comprises~~comprising a cylindrical cam provided with the same axis as that of said chamber; and a rotary actuator dynamically connected with said cylindrical cam, wherein the turning moment of said rotary actuator is converted into the vertical thrust of said axis and said plate rises and descends~~.~~,

the cam having a groove threaded so that the moving speed decreases immediately before the plate contacts said sealing surface and said plate is locked in a state of rest when it contacts the sealing surface and can withstand forces on the plate caused by pressure differential between the chambers that biases the plate away from the sealing surface.

Claims 2 and 9 have been canceled.

Claim 11 has been added.